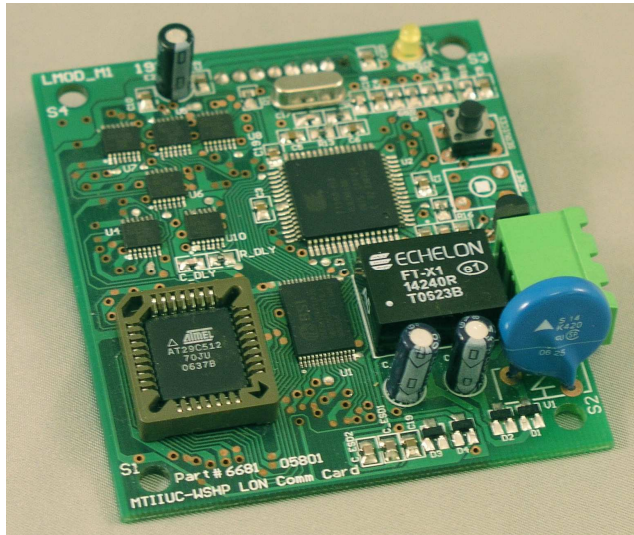| Group: Daikin Controls |
| --- |
| Part Number: 669207603 |
| Date: May 2012 |
| Supercedes: IM 927-2 |

MicroTech® III
Water Source Heat Pump
LONWORKS® Communication Module

NOTICE

Use this manual to physically connect the LonWorks Communication Module to Daikin MicroTech® III Water Source Heat Pump Controller, and connect the MicroTech III Controller to the network. Connections and service to the MicroTech III Controller must be performed only by personnel knowledgeable in the operation of the equipment being controlled. Use the appropriate Engineering Data (ED), known as the Protocol Information document, to integrate the unit into your network. The Protocol Information document contains addressing details, LONWORKS® protocol information, and a list of the data points available to the network. See the Reference Documents section of this manual for Protocol Information document numbers. MicroTech III control integration literature is available from your local Daikin sales representative and on www.DaikinApplied.com.

LONMARK®3.4

🟦DAIKIN

Contents

Figures

Revision History

IM 927	September 2008	Initial release
IM 927-1	July 2009	Added PN to front cover, added sensors to Parts list.
IM 927-2	March 2011	Added Wink details to integration section. Changed unit controller description from Unitary to Applied Terminal Systems.
IM 927-3	May 2012	Updated Daikin logo and associated references. Minor formatting.

Reference Documents

Number	Company	Title	Source
078-0014-01E	LonMark® Interoperability Association	LonMark® Layers 1-6 Interoperability Guidelines, Version 3.0	www.lonmark.org
078-0120-01E	LonMark Interoperability Association	LonMark Application Layer Interoperability Guidelines, Version 3.2	www.lonmark.org
078-0156-01G	Echelon® Corporation	LonWorks® FTT-10A Free Topology Transceiver Users Guide	www.echelon.com
8503_	LonMark Interoperability Association	Space Comfort Controller (SCC) – Heat Pump Functional Profile	www.lonmark.org
ED 15103	Daikin	Protocol Information for MicroTech III Water Source Heat Pump Unit Controller, LonWorks and BACnet MS/TP	www.DaikinApplied.com
OM 931	Daikin	MicroTech III Water Source Heat Pump Unit Controller Operation and Maintenance Manual	www.DaikinApplied.com

Trademark Notices

General Information

This manual contains the information you need to install the LONWORKS® Communication Module to a MicroTech III Water Source Heat Pump (WSHP) Unit Controller and integrate it into the network.

Hazard Identification Messages

⚠ DANGER
Dangers indicate a hazardous situation which will result in death or serious injury if not avoided.

⚠ WARNING
Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

⚠ CAUTION
Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

⚠ WARNING
Electric shock hazard. Can cause personal injury or equipment damage.
This equipment must be properly grounded. Connections and service to the MicroTech III Unit Controller must be performed only by personnel knowledgeable in the operation of the equipment being controlled.

⚠ CAUTION
Static sensitive components. Can cause equipment damage.
Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

NOTICE
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. **Daikin disclaims any liability resulting from any interference or for the correction thereof.**

Description

A LONWORKS Communication Module provides the interface between the MicroTech III WSHP Unit Controller and a LONWORKS Local Operating Network (LON). It translates the LonTalk® variables used on the network to the variables used in the unit controller and vice versa. It translates in accordance with the LONMARK Functional Profile. Profiles are interpreted in loaded programs (firmware).

The LONWORKS Communication Module is a printed circuit board that connects onto the top side of the MicroTech III Unit Controller Baseboard. Figure 1 shows an outline drawing of the printed circuit board.

Application

A LONWORKS communication module connects the MicroTech III WSHP Unit Controller to the building automation system (BAS) on a LONWORKS network. It is the interface adapter for the exchange of LonTalk variables between the network and the unit controller. The LONWORKS communication module translates the LonTalk variables to the unit controller. Refer to the MicroTech III WSHP Unit Controller Operation Manual, available on www.DaikinApplied.com, for details.

Component Data

Figure 1 shows the location of the major components of the LONWORKS communication module.

Service Switch

The service switch generates a service-switch message, which contains the Neuron® ID and the program code identification of the node. A service-switch message is a network message that is generated by a node and broadcast on the network. It can be used to commission the LONWORKS network.

The service switch button is located between the LON connector and the LEDs. To activate the service switch, push the small round black button on top of the service switch.

Figure 1. LONWORKS *Communication Module Major Components*

Light Emitting Diode (LED)

Table 1 below describes the LONWORKS communication module Service LED activity.

Table 1. LED Activity Summary

LED Activity	Description
LED flashes once at power up or comes on when pressing the Service switch.	Normal operation
LED is Off continuously as soon as power is applied to device.	Faulty device hardware and/or Neuron Chip. Faulty power supply or clock.
LED is ON continuously, ever when power is first applied to the device.	Faulty device hardware.
LED flashes at power-up, goes OFF, then comes ON solid.	This is the normal activity for a device without Application software. If the device does have an Application, this could indicate a Checksum error and the APB or NXE file should be downloaded, specifying that the configuration properties are read from the application
LED flashes briefly once every second or once every two seconds.	This device is likely experiencing continuous Watchdog resets. For a Neuron 3120 Chip device, this could also indicate incompatible Application software.
LED blinks ON & Off at ½ Hz rate	This is the normal activity for a decommissioned device. If the device has been commissioned, this could indicate a Checksum error and the APB or NXE file should be downloaded, specifying that the configuration properties are read from the application.

LONWORKS Network Connector (TB1)

TB1 connects the LONWORKS communication module to the LONWORKS FTT-10 bus. Since the LONWORKS communication module is not polarity sensitive, it is not necessary to observe polarity when making connections via the unshielded twisted-pair wiring. Pin #1 is next to the label, TB1, on the LONWORKS communication module circuit board (see Table 2 for details).

Table 2. LONWORKS Communication Module Network Connectors

Pin	Designation	Function
1	SHLD	Not Used
2	-/A	FTT-10
3	+/B	FTT-10

8-Pin Header

The 8-pin header connects the Unit Controller Baseboard Serial Peripheral Interface (SPI) Bus to the LONWORKS communication module at the bottom of the communication module (see Figure 1).

LonMark Profile Software

The LONWORKS communication module software translates the Standard Network Variable Types (SNVTs) and Standard Network Configuration Parameter Types (SCPTs) in accordance with the LONMARK profiles used on the LONWORKS network into the variables and parameters used in the unit controller.

Neuron

The basis of the LONWORKS communication module is an Echelon Neuron chip. Each Neuron chip stores a globally (i.e., worldwide) unique, 48-bit serial number called the Neuron ID. The Neuron ID can be used to address the device on the LONWORKS network.

Transceiver

The Echelon Corporation Free Topology Transceiver (FTT-10) is used to communicate on the LONWORKS network. The network topology may consist of a star, daisy-chain bus, ring, or other topology (see Figure 4). Data transmission rate on the network is 78-kbps (baud).

Specifications

Table 3 below summarizes the LONWORKS communication module specifications.

Table 3. LONWORKS Communication Module Specifications

Characteristic	Description
Network Topology	Flexible Free Topology
Neuron Chip Processor	3150
Free Topology Transceiver (FTT-10)	50051
Cable Types	Belden 8471, NEMA Level 4, or Echelon-approved equivalent
Maximum Bus Length	1640 ft (500) meters per segment
Maximum Node Separation	1317 ft (400 meters)
Data Transmission	Two-wire, half duplex
Data Transmission Rate	78 kbps (baud)

Installation

The LONWORKS communication module can be installed in the field or it can be installed in the factory. The module mounts on connector pins and is held in place with four plastic, edge-holding circuit board supports. Field wiring connections to the LONWORKS network are made at the three-terminal plug (TB1) on the LONWORKS communication module.

Mounting

LONWORKS Communication Module Installation Procedure

> ⚠ **DANGER**
>
> The terminals on the Water Source Heat Pump unit controller are high voltage. Disconnect power to avoid electrical shock potential, which will result in death or serious injury if not avoided.

1. Disconnect power from the MicroTech III WSHP unit controller (i.e. baseboard).
2. Unplug the unwired female network-cable connector from the board-mounted male plug, TB1.
3. Install the four standoffs on the baseboard (see Figure 3).
4. Locate the 8-pin male connector on the baseboard. Orient the printed-circuit board so that the component side faces away from the baseboard and the connector pins can mate with the connector on the bottom of the LONWORKS communication module. Press the LONWORKS communication module on to the baseboard connector pins and standoffs until you hear the faint click of the locking standoffs securing the module in place.
5. Connect the LONWORKS network cable to the female network-cable connector using a flat-blade screwdriver. Then reinsert the plug into TB1 on the LONWORKS communication module (see Figure 4).
6. Reapply power to the unit controller.

Note: The LONWORKS communication module software version requires compatibility with the unit controller baseboard software version. Refer to the MicroTech III WSHP Unit Controller Operation and Maintenance manual for details.

LONWORKS Communication Module Replacement Procedure

> ⚠ **DANGER**
>
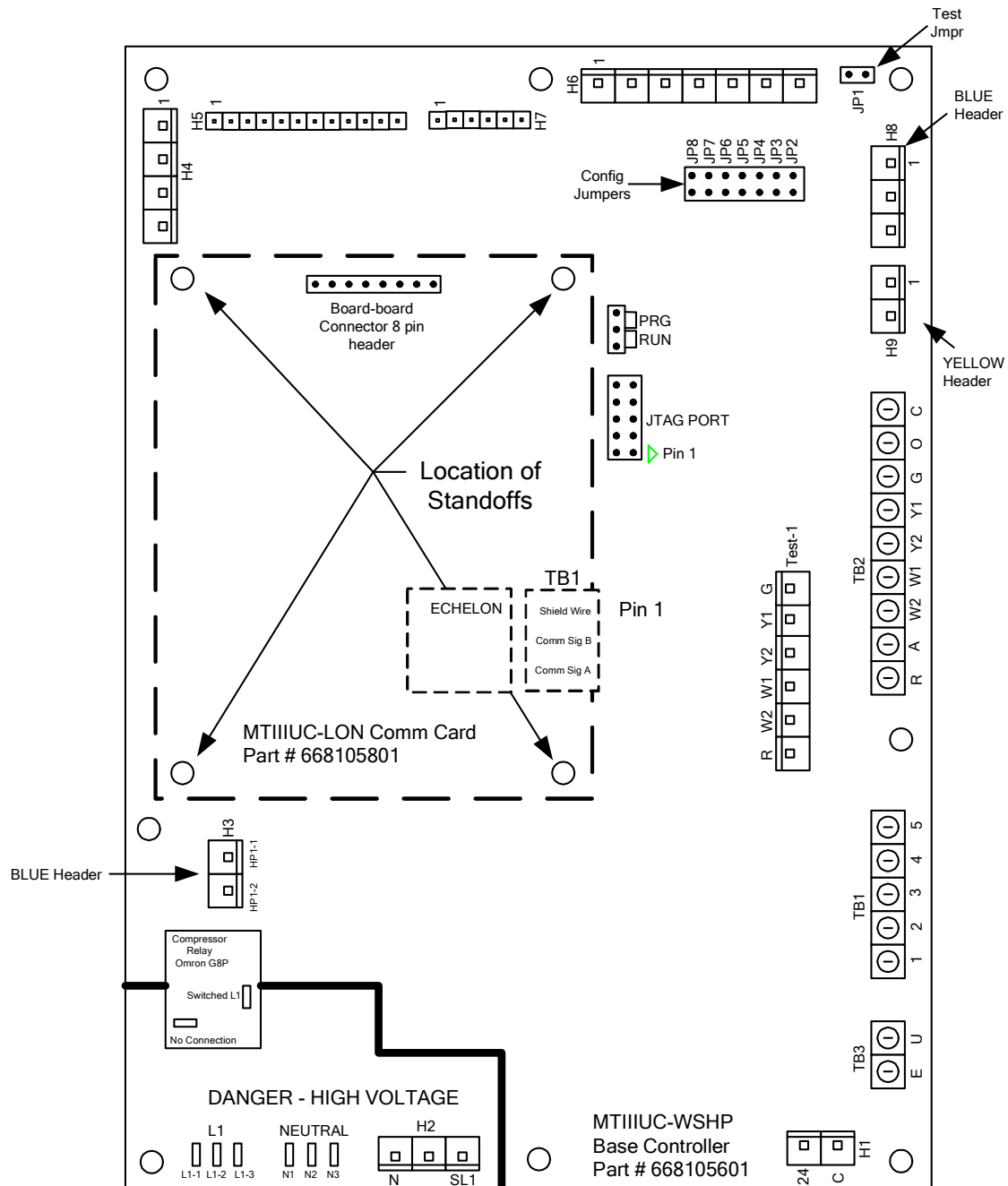> The terminals on the unit controller are high voltage. Disconnect power to avoid electrical shock potential, which will result in death or serious injury if not avoided.

1. Disconnect power from the WSHP unit controller.
2. Unplug the wired female network-cable connector from the board-mounted male plug, TB1.
3. Locate the standoffs used to connect the LONWORKS communication module to the baseboard.
4. Use a finger or screwdriver to depress the barb on one standoff and gently pull the corner of the board over the tab. Take care not to bend the module or misalign the connector pins.
5. Proceed to the other three corners and pull the board over the standoffs.
6. Gently lift the LONWORKS communication module from the baseboard.
7. Locate the blank connector and four standoffs for the LONWORKS communication module on the baseboard (see Figure 2).

8. Orient the LONWORKS communication module's printed circuit board so that the component side faces away from the baseboard and the connector pins can mate with the connector on the LONWORKS communication module.

9. Press the module onto the connector pins and standoffs until you hear the faint click of the locking standoffs securing the module in place.

10. Reinsert the plug into TB1 on the LONWORKS communication module (see Figure 1).

Figure 2. Mounting a LONWORKS Communication Module to the Unit Controller Baseboard
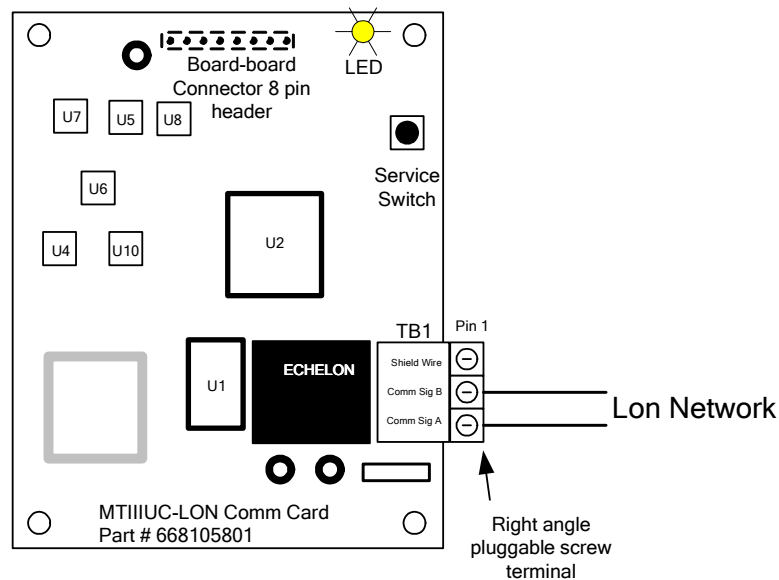
Integration

Integrating the LONWORKS communication module into a BAS involves three steps:
• Connecting the unit (node) to the network
• Addressing and establishing communications with the unit
• Configuring the unit to the building

Connecting Unit to the Network

After the LONWORKS communication module has been properly installed on the WSHP unit controller, it can then be connected into the LONWORKS network. Figure 3 shows the LONWORKS communication module for the WSHP unit controller with the network connector attached and the LONWORKS communication network wired to TB1 pins 2 and 3.

Figure 3. Field Wiring Integration

Network Topology

Each LONWORKS communication module is equipped with an FTT-10A transceiver for network communications. This transceiver allows for (1) free topology network wiring schemes using twisted pair (unshielded) cable and (2) polarity insensitive connections at each node. These features greatly simplify installation and reduce potential network commissioning issues. Additional nodes may be added with little regard to the existing cable routing.
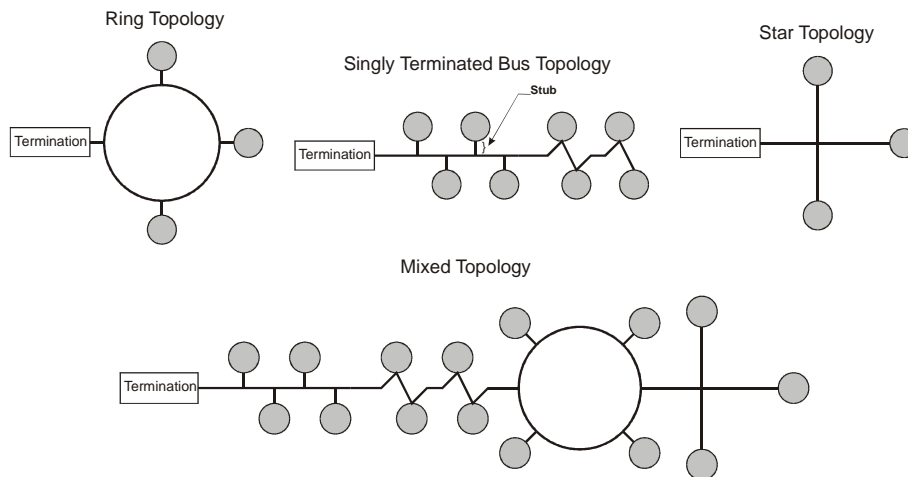
Free Topology Networks

A LONWORKS "free topology network" means that devices (nodes) can be connected to the network in a variety of geometric configurations. For example, devices can be daisy-chained from one device to the next, connected with stub cables branching off from a main cable, connected using a tree or star topology, or any of these configurations can be mixed on the same network (see Figure 4). Free topology segments require termination for proper transmission performance. Only one termination is required. It may be placed anywhere along the segment. Refer to the Echelon LONWORKS FTT-10A Transceiver User's Guide for details.

Free topology networks may take on the following topologies:
- Bus
- Ring
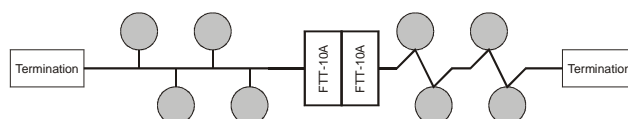- Star
- Mixed - Any combination of Bus, Ring, and Star

Note: Limitations to wire lengths apply and must be observed.

Figure 4. Singly Terminated Free Topology Networks

A network segment is any part of the free topology network in which each conductor is electrically continuous. Each of the four diagrams is an illustration of a network segment. Some applications may require two or more segments; see the "Free Topology Restrictions" section on the next page of this manual. If necessary, segments can be joined with FTT-10A-to-FTT-10A physical layer repeaters (see Figure 5). Refer to the Echelon LONWORKS FTT-10A Transceiver User's Guide for details.

Figure 5. Combining Network Segments With a Repeater

Free Topology Restrictions

Although free topology wiring is very flexible, there are restrictions. A summary follows below. Refer to the Echelon FTT-10A User's Guide for details. The maximum number of nodes per segment is 64.

1. The maximum total bus length depends on the wire size (see Qualified Cables section for details).

2. One termination is required in each segment. It may be located anywhere along the segment.

Wire Size	Maximum Node-to-Node Length	Maximum Cable Length
24 AWG	820 ft (250 m)	1476 ft (450 m)
22 AWG	1312 ft (400 m)	1640 ft (500 m)
16 AWG	1640 ft (500 m)	1640 ft (500 m)

The longest cable path between any possible pair of nodes on a segment must not exceed the maximum node-to-node distance. If two or more paths exist between a pair of nodes (e.g., a loop topology), the longest path should be considered. Note that in a bus topology, the longest node-to-node distance is equal to the total cable length.
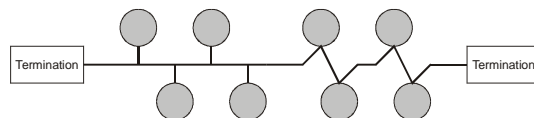
Note: The total length of all cable in a segment must not exceed the maximum total cable length.

Doubly Terminated Networks

You can extend the maximum total cable length without using a repeater by using a doubly terminated network topology (see Figure 6). The trade-offs are (1) this network topology must be rigorously followed during the installation and subsequent retrofits and (2) two terminations must be installed at the ends of the bus for proper transmission performance. Refer to Echelon LONWORKS FTT-10A Transceiver User's Guide for details.

Note: Limitations to wire lengths apply and must be observed.

Figure 6. Doubly Terminated Network Topology

Doubly Terminated Topology Restrictions

The restrictions on doubly terminated bus topology are as follows:

1. The maximum number of nodes per segment is 64.
2. The maximum total bus length depends on the wire size (see the "Qualified Cables" section in this manual for details).

Wire Size	Maximum Cable Length
24 AWG	2952 ft (900 m)
22 AWG	4590 ft (1400 m)
16 AWG	8855 ft (2700 m)

3. The maximum stub length is 9.8 ft (3 m).

   A stub is a piece of cable that is wired between the node and the bus.

4. Two terminations are required in each segment. One must be located at each end of the bus.

> **Note:** If the bus is wired directly to the node, there is no stub, and thus the stub length is zero. If you are wiring to a field terminal strip on a unit, you should account for any factory wiring between the terminal strip and the MicroTech III unit controller. This wiring is considered part of the stub.

Physical Network

Qualified Cables

Echelon has qualified three twisted-pair network communications cables that are available from a large number of different sources. Refer to the Echelon LONWORKS FTT-10A Free Topology Transceiver Users Guide for cable specification details. Some local codes or applications may require the use of plenum-rated cable. The following cables meet this specification:

1. TIA568A Category 5 cable (24AWG/0.51mm)
2. NEMA Level IV cable (22AWG/0.65mm)
3. Generic 16AWG (1.3mm) (similar to Belden 85102)

⚠ CAUTION

Do not install the cable in the same conduit with power wiring. The temperature of the cable must not exceed 131 ºF (55 ºC), which can result in personal injury or equipment damage if not avoided.

> **Note:** Ideally, you should connect two unit controllers with one continuous piece of cable in order to reduce the risk of communications errors. If you must splice the cable, use crimp-type butt connectors (good) or solder (best). Do not use wire nuts.

Network Cable Termination

LONWORKS network segments require termination for proper data transmission performance. The type and number of terminations depend on network topology. Refer to the Echelon LONWORKS FTT-10A Transceiver User's Guide for details.

Addressing and Establishing Communication

LONWORKS Network Addressing

Every Neuron Chip has a unique 48-bit Neuron ID or physical address. This address is generally used only at initial installation or for diagnostic purposes. For normal network operation, a device address is used.

Device addresses are defined at the time of network configuration. All device addresses have three parts. The first part is the Domain ID, designating the domain. Devices must be in the same domain in order to communicate with each other. The second part is the Subnet ID that specifies a collection of up to 127 devices that are on a single channel or a set of channels connected by repeaters. There may be up to 255 subnets in a domain. The third part is the Node ID that identifies an individual device within the subnet.

A group is a logical collection of devices within a domain. Groups are assembled with regard for their physical location in the domain. There may be up to 256 groups in a domain. A group address is the address that identifies all devices of the group. There may be any number of devices in a group when unacknowledged messaging is used. Groups are limited to 64 devices if acknowledged messaging is used.

A broadcast address identifies all devices within a subnet or domain.

Commissioning the Network

Pressing the service pin generates a service-pin message, which contains the Neuron ID and the program code identification of the node. A service-pin message is a network message that is generated by a node and broadcast on the network. It can be used to commission the LONWORKS network.

A network configuration tool maps device Neuron IDs to the domain/subnet/node logical addressing scheme when it creates the network image, the logical network addresses and connection information for all devices (nodes) on the network.

External Interface File (XIF) and NXE Files

LONMARK guidelines specify exact documentation rules so that proprietary configuration tools are not required to commission and configure LONWORKS devices. The LONWORKS Communication Module is self-documenting so that any LONWORKS network management tool can obtain all the information needed over the network to connect it into the system and to configure and manage it.

An external interface file (a specially formatted PC text file with the extension .XIF) is required, along with LONWORKS network management tool, so that you can design and configure the device prior to installation.

The NXE file contains the application image that is downloaded into the LONWORKS Communication Module. The LONWORKS Communication Module uses a separate NXE file specific to the WSHP-SCC functional profile.

The XIF and NXE files are available at www.DaikinApplied.com or www.lonmark.org. Refer to MicroTech III WSHP Unit Controller Protocol Information, ED 15103 for additional details.

Resource Files

Resource files contain definitions of functional profiles, network variables types, configuration property types, and enumerations. *Resource files are used during the commissioning process and are required for displaying user-specific variables that are not included in the standard device profile.* These files must be downloaded to the BAS front end workstation or other commissioning device. They are available at www.DaikinApplied.com or www.lonmark.org. Refer to ED 15103 for additional details.

The Network "Wink" Command

A wink command is initiated by the BAS or through the LONWORKS commissioning software. The "wink" identification function allows verification of an individual unit controller network address without having to physically open the unit's access panels. The compressor shuts off during this period and the Minimum Compressor Off Timer must expire before the compressor is allowed to run again. The Wink command can be used during all operating and non-operating modes (ex. Alarms) except for Brownout Mode.

Upon receiving a wink command from a network management node, the Unit Controller exhibits the following identification sequence (all occur simultaneously):

- Room Sensor LED flashes (on 0.5 sec, off 0.5 sec) for 15 seconds.

- Fan: The fan turns off for 5 seconds, turns on for 5 seconds, then off again for 5 seconds.

- Compressor: The compressor turns off for a minimum of 15 seconds.

Configuring the Unit Controller

The LONWORKS communication module is LONMARK 3.4 certified and is configured in accordance with the LONMARK Space Comfort Control (SCC) functional profile. The unit controller, along with the LONWORKS communication module, is ready to operate with the default parameter values in the unit controller. Refer to the ED protocol document for descriptions of the available LONWORKS variables.

Service Information

Test Procedures

If you can control the unit from the local room sensor or thermostat, but you are unable to communicate with the unit via the network:

- Check the network wiring.
- Check addressing -- press the Service Switch on the communication module to send the service message to the network. The service Switch message contains the Neuron ID and the program code identification of the node.

If the LONWORKS communication module still does not respond, contact the Controls Customer Support Group at 866-462-7829.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit wwwDaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.